

WHAT IS CLAIMED IS:

1. A drainage device for draining unwanted matter from a body cavity of an animal, the drainage device comprising:

a tube having first and second ends, said first end adapted to connect to a vacuum source of at least approximately 50 torr, said second end adapted to be inserted into a body cavity of an animal; and

a plurality of holes formed into the wall of an insertion portion of said tube, said insertion portion of said tube configured to be inserted into said body cavity of said animal, each of said plurality of holes communicating a respective suction force from an inner bore of said tube to matter outside said tube, the area of each of said plurality of holes selected such that each of said respective suction forces is insufficient to cause injury to proximate body tissues within said body cavity of said animal.

2. The drainage device as described in Claim 1, wherein said animal is a human.

3. The drainage device as described in Claim 1, wherein said body cavity is a chest cavity.

4. The drainage device as described in Claim 1, wherein a thickness of the wall of said tube is selected to maintain the structural integrity of said tube when said first end of said tube is connected to a vacuum source of approximately 100 torr or greater.

5. The drainage device as described in Claim 4, wherein at least 100 holes are formed into the wall of said tube.

6. The drainage device as described in Claim 1, wherein each hole has an area no greater than that of a circle having a diameter of around one half of an internal diameter of said tube.

7. The drainage device as described in Claim 1, wherein each hole is approximately circular and has a diameter no greater than around one half of an internal diameter of said tube.

8. The drainage device as described in Claim 1, wherein each hole has an area no greater than that of a circle having a diameter of 1 mm.

9. The drainage device as described in Claim 1, wherein each hole has an area no greater than that of a circle having a diameter of .5 mm.

10. The drainage device as described in Claim 1, wherein the size of said tube corresponds to 20F or smaller.

11. The drainage device as described in Claim 1 further comprising:

a one-way valve located between said insertion portion of said tube and said vacuum source, said one-way valve permitting flow of gas or fluid through said one-way valve from said body cavity toward said vacuum source, said one-way valve restricting flow of gas or fluid through said one-way valve from said vacuum source and toward said body cavity.

12. The drainage device as described in Claim 11, wherein said one-way valve is located in a connector interposed between said tube and said vacuum source, said connector having a first end adapted to be connected to said first end of said tube, said connector having a second end adapted to be connected to a vacuum source of at least about 50 torr.

13. The drainage device as described in Claim 1 further comprising:

a vacuum chamber, said vacuum chamber having a gas outlet port adapted to be connected to a vacuum source of at least about 50 torr, said vacuum chamber having an inlet port connected to said first end of said tube, said inlet port communicating a suction force from said gas outlet port to said first end of said tube, said vacuum chamber having a fluid drainage outlet port through which fluid matter from said body cavity flows in a direction away from said body cavity.

14. The drainage device as described in Claim 13 further comprising:

a vacuum relief valve included in said vacuum chamber, said vacuum relief valve opening to direct atmospheric air into said vacuum chamber when a vacuum pressure inside said vacuum chamber exceeds a predetermined threshold.

15. A high vacuum pressure body cavity drainage system, comprising:

a vacuum source of approximately 50 torr or greater; and

a tube having first and second ends, said first end of said tube adapted to be connected to said vacuum source, said tube having side holes in the wall of an insertion portion of said tube, said insertion portion of said tube configured to be inserted into a body cavity of an animal, each of said side holes conveying a respective suction force from an inner bore of said tube to matter outside said tube, the area of each of said side holes selected such that said respective suction force

conveyed by each of said holes is insufficient to cause injury to living tissue in said body cavity.

16. The high vacuum pressure body cavity drainage system described in Claim 15, further comprising:

a one-way valve maintaining unidirectional flow of gas and fluid from said body cavity toward said vacuum source, said one-way valve located between said insertion portion of said tube and said vacuum source, said one-way valve configured to maintain such unidirectional flow when said vacuum source is around 50 torr or more.

17. The high vacuum pressure body cavity drainage system described in Claim 15, further comprising:

a vacuum relief valve having an atmosphere side and a vacuum side, said vacuum relief valve opening to admit atmospheric air through said vacuum relief valve when a vacuum pressure on said vacuum side of said vacuum relief valve exceeds a predetermined threshold, said vacuum relief valve located between said insertion portion of said tube and said vacuum source.

18. The high vacuum pressure body cavity drainage system described in Claim 15, further comprising:

a vacuum chamber located between said insertion portion of said tube and said vacuum source, said vacuum chamber substantially separating fluid matter drained from said body cavity from gaseous matter drained from said body cavity.

19. The high vacuum pressure body cavity drainage system described in Claim 15 wherein said vacuum source is of approximately 100 torr or greater.

20. A highly efficient body cavity drainage system, comprising:

a vacuum source of approximately 50 torr or greater; and

a tube having a vacuum end and an insertion end, said vacuum end of said tube adapted to receive a vacuum force, said tube having sufficient structural strength to avoid collapse when said vacuum force is applied to said vacuum end, said tube having side holes in the wall of an insertion portion of said tube near said insertion end, said insertion portion of said tube configured to be inserted into a body cavity of an animal, each of said side holes directing a respective suction force from a space inside said tube to a space outside said tube, the area of each of said

side holes selected such that said respective suction force directed by each of said holes is insufficient to cause injury to the portions of the body of said animal exposed in said body cavity;

a connector having a drainage tube end and a vacuum end, said connector having a one-way valve permitting a flow of fluid or gas from said drainage tube end toward said vacuum end of said connector, said one-way valve substantially restricting a flow of fluid or gas from said vacuum end of said connector toward said drainage tube end, said drainage tube end coupled to said vacuum end of said tube, said vacuum end of said connector adapted to receive a vacuum force; and

a vacuum chamber, said vacuum chamber having a gas outlet port coupled to said vacuum source, said vacuum chamber having an inlet port coupled to said vacuum end of said connector, said inlet port communicating a vacuum force from said gas outlet port to said vacuum end of said connector, said vacuum chamber having a fluid drainage outlet port through which fluid matter from said body cavity flows in a direction away from said body cavity.

21. The highly efficient body cavity drainage system described in Claim 20, further comprising:

a vacuum relief valve in said vacuum chamber, said vacuum relief valve having an atmosphere side and a vacuum side, said vacuum relief valve opening to admit atmospheric air through said vacuum relief valve when a vacuum pressure on said vacuum side of said vacuum relief valve exceeds a predetermined threshold.

22. The highly efficient body cavity drainage system described in Claim 20, wherein said vacuum source is of approximately 100 torr or greater.

23. The highly efficient body cavity drainage system described in Claim 20, wherein the largest area of any of said side holes is approximately that of a circle having a diameter of less than one half the internal diameter of said tube.

24. The highly efficient body cavity drainage system described in Claim 20, wherein the largest area of any of said side holes is approximately that of a circle having a diameter of 1 mm or less.

25. The highly efficient body cavity drainage system described in Claim 20, wherein the largest area of any of said side holes is approximately that of a circle having a diameter of .5 mm or less.

26. A high vacuum pressure, high efficiency body cavity drainage system, comprising:

means for receiving a vacuum source of approximately 50 torr or greater;

means for distributing and applying said vacuum source to a multiplicity of locations within a body cavity of an animal; and

means for regulating the respective suction force applied at each of said multiplicity of locations such that each of said respective suction forces is incapable of injuring bodily tissue exposed within said body cavity.

27. The high vacuum pressure, high efficiency body cavity drainage system described in Claim 26, further comprising:

means for maintaining a unidirectional flow of fluids and gas drained from said body cavity in a direction away from said body cavity.

28. The high vacuum pressure, high efficiency body cavity drainage system described in Claim 26, further comprising:

means for maintaining vacuum pressure in said high pressure, high efficiency body cavity drainage system at a predetermined level by allowing atmospheric air to enter said drainage system when said vacuum pressure in said drainage system exceeds said predetermined level.

29. The high vacuum pressure, high efficiency body cavity drainage system described in Claim 26, further comprising:

means for separating fluids drained from said body cavity from gases drained from said body cavity.